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WADC TECHNICAL REPORT 54-134

APPLICATION OF SPECIFICATION

MIL E 5272

TO

GROUND SUPPORT EQUIPMENT

Wallace S. Newton, B.S., M.S.
Constantine G. Makrides, B.S.

CORVEY ENGINEERING COMPANY

JUNE 1954

WRIGHT AIR DEVELOPMENT CENTER

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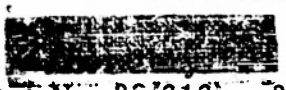

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WRIGHT AIR DEVELOPMENT CENTER
Air Research and Development Command
United States Air Force
Wright - Patterson Air Force Base, Ohio

FOREWARD

This report was prepared by Corvey Engineering Company, Washington, D. C. under USAF Contract No. 33(616)-2278, "Environmental Criteria for USAF Ground Support Equipment." The Contract required a comprehensive literature survey supplemented by personal interviews with activities experienced in this field. The Contract was initiated and administered by the Environmental Criteria Branch, Plans and Operations Office, Directorate of Laboratories, Wright Air Development Center, under a project identified by Research and Development Order No. R-560-87. The WADC project engineer was Mr. R. K. Hankey.

Mr. E. C. Theiss, and Mr. J. R. Grimm, of the Environmental Criteria Branch, generously devoted much time and their experience to the furtherance of this work.

During the course of the literature search and personal interviews, many military and civilian personnel of Libraries, Laboratories, Test Stations, Maintenance and other Activities contributed their time and data to this project. Having had the benefit of their cooperation has enhanced the value of the data presented herein.

ABSTRACT

A review of Specification MIL-E-5272 and Air Material Command, memorandum Report MCREOC-51-5, 15 January 1951, has been made in light of the data studied during the course of this Contract. Specification MIL-E-5272 is not considered suitable for application to Ground Support Equipment because many of the test procedures are too elaborate and various exceptions or modifications would have to be made. There are a multitude of items which expend their service life under shelter and should not reasonably be expected to pass test procedures which involve high altitudes, extreme low temperatures, or other simulated environments not likely to be encountered. It would be more preferable to write a new specification rather than apply one which contains much extraneous matter of significance only to airborne equipment.

In general the requirements of Specification MIL-E-5272 can apply to unsheltered ground support equipment. Many of the test procedures can also be applied as can others with some modifications. Most of the test procedures which do not apply have been designed to evaluate airborne equipment.

The applicable test procedures and others which can apply with modifications are available as a nucleus for a new specification which could take into consideration sheltered or unsheltered ground operation world wide.

PUBLICATION REVIEW

The publication of this report does not constitute approval by the Air Force of the findings or the conclusions contained therein. It is published only for the exchange and stimulation of ideas.

FOR THE COMMANDER:

Louis W. Tibbett, 2d Lt USAF

for DANIEL B. WHITE
Colonel, USAF
Director of Laboratories

TABLE OF CONTENTS

INTRODUCTION

This technical report has been written in conjunction with WADC TR 54-132, "Effect of Climate and Environment on Ground Support Equipment," and WADC TR 54-133, "Environmental Criteria for Ground Support Equipment."

Specification MIL-E-5272 is intended to prescribe procedures to be followed in subjecting equipment to simulated and accelerated environmental conditions in order to insure satisfactory operation and to reduce deterioration when the equipment is operated or stored in any global locality.

Ground Support Equipment covers a broad field including many hundreds of items, which when deployed on a world-wide basis, will, during their service life, encounter some one or some combination of all known natural and/or most induced environments for varying periods of time.

Many hundreds of items can be expected to render service indoors where they are sheltered from extreme climatic effects and protected from other environments for purposes of this report, shelter is interpreted to mean a protection or place of protection, such that the extremes of natural and induced environments are excluded, and that there is reasonable facility for human occupation endeavor and comfort. For example, a maintenance shop or test laboratory, where the ambient temperature would not fall below 32°F, which was weather tight and ventilated, in which, personnel could work with ease, is considered one of the many types of sheltered areas.

Numerous other items operate outdoors completely unsheltered, except for their inherent design. For purposes of this report, equipment which is unsheltered is interpreted to mean those items which normally operate outside of sheltered areas and are exposed to the extreme natural and induced environmental stresses.

The review of specification MIL-E-5272 contained in this report has been made from the viewpoint of ground support equipment as a whole rather than a single item or class of items. From this comprehensive viewpoint, it appears that certain tests are not significant while at the same time it is realized that there may be some item whose performance or condition could be evaluated thereby.

Once the requirements for an item have been established it is imperative that the testing procedure be designed so that it will truly simulate service operation and will truly accelerate environmental conditions. Sheltered equipment should not be required to pass environmental tests which are designed to simulate conditions which will not be encountered in service. In general the extreme environmental tests of specifications MIL-E-5272 have little significance in relation to sheltered equipment and the use of this specification should be held to a minimum. Unsheltered equipment offers a more fertile field for the application of environmental tests. Personnel concerned with the preparation of the detail specification for an item should satisfy themselves that the tests are truly significant and not be misled by generalities.

Certain additional test procedures appear desirable, particularly to evaluate performance of unsheltered equipment intended for Arctic and Subarctic use under rapidly applied loads at temperatures down to minus 65°F, and to determine its ability to withstand blowing snow penetration and snow load.

The following review of Specification MIL-E-5272, 16 September 1952, is arranged in the same order in which the environmental factors appear in that Specification and the reader should have it at hand for ready reference. The numbers listed under "Requirements" and "Test Procedures" are the pertinent paragraph numbers in the Specification to which the "Review Comments" refer. Comments have also been noted on certain environmental factors not included in the Specification.

SECTION I

TEMPERATURE

MIL-E-5272 Paragraph Number	Review Comment
Requirements	
3.1.1.1	Can apply except rate is not significant.
3.1.1.2	Can apply except rate is not significant.
Test Procedures	
4.1	High Temperature Test.
4.1.1	Can apply to unsheltered equipment. It would not be necessary to test sheltered equipment above 125°F. This does not include equipment especially designed to operate at elevated temperatures circa 350°F.
4.2	Low Temperature Test.
4.2.1	Can apply to unsheltered equipment intended for Arctic and Subarctic use. The low temperature limit for unsheltered equipment intended for temperate zone use should be minus 25°F. This should be met without any elaborate winterization measures. The low temperature limit for sheltered equipment should be 32°F.
4.2.2	Can apply for storage and to air transportable items intended for Arctic and Subarctic use as unsheltered equipment. The first sentence can apply for storage and to air transportable items intended for use as sheltered equipment. A temperature of 32°F should be used in lieu of -65°F for sheltered equipment.
4.3	Temp Shock Test.
4.3.1	Not Significant.
4.3.2	Not Significant.

SECTION II

HUMIDITY

Requirements

3.1.2	Can apply.

Test Procedures

4.4	Humidity Tests.
4.4.1	Can apply to unsheltered and sheltered equipment intended for use in warm humid areas. This test would find more application to ground support equipment than either of procedures 4.4.2 or 4.4.3, however some modifications of time and temperature may be required to more properly evaluate specific items.
4.4.2	Not significant since 4.4.1 is available and can be modified.
4.4.3	Not significant since 4.4.1 is available and can be modified.

NOTE: It is more desirable to have a single test procedure rather than a choice of three.

SECTION III

ALTITUDE

Requirements

3.1.3	Can apply up to altitudes of 6000 ft; however, the rate is not significant.

Test Procedures

4.5	Altitude Tests.
4.5.1	Can apply except that 6000 ft is sufficient. A test at 10,000 ft would only be required for a few specific items. Operation at minus 65°F need apply only to unsheltered equipment intended for Arctic and Subarctic use. The low temperature

limit for unsheltered equipment intended for temperate zone use should be minus 25° F and that for sheltered equipment should be 32° F.

4.5.2 Can apply to air transportable items except for operation of equipment.

4.5.3 Not significant.

4.5.4 Not significant.

SECTION IV

SALT SPRAY

Requirements

3.1.4 Can apply.

Test Procedures

4.6 Salt Spray Tests.

4.6.1 Can apply to unsheltered equipment.

SECTION V

VIBRATION

Requirements

3.1.5 Can apply.

Test Procedures

4.7 Vibration Tests.

4.7.1 Not significant.

4.7.2 Not significant.

4.7.3	Not significant.
4.7.4	Not significant.
4.7.5	Not significant.
4.7.6	Can apply.
4.7.7	Not significant.
4.7.8	Not significant.
4.7.9	Can apply.
4.7.10	Not significant.
4.7.11	Not significant.

NOTE: Vibration tests should be designed for ground support equipment which will be realistic and simulate conditions in service.

SECTION VI

FUNGUS

Requirements

3.1.6	Can apply.

Test Procedures

4.8	Fungus Resistance Tests.
4.8.1	Can be applied to sheltered and unsheltered equipment containing nutrient material which is intended for moist tropic use.

SECTION VII

SUNSHINE

Requirements

3.1.7	Can apply.

Test Procedures

4.9	Sunshine Tests.
4.9.1	Can be applied to unsheltered equipment containing material subject to deterioration by light except that 86 to 105 watts per square foot, 50% wavelengths above 7000 angstrom units and 6% below 4000 angstrom units with test chamber temperature maintained at 125°F, would be more realistic.

SECTION VIII

RAIN

Requirements

3.1.8	Can apply.

Test Procedures

4.10	Rain Tests.
4.10.1	Can apply to unsheltered equipment.

NOTE: A twenty-four hour rain cycle test similar to MIL-STD-210, 1 June 1953 can apply to equipment not expected to withstand the Immersion Test.

SECTION IX

SAND AND DUST

Requirements

3.1.9	Can apply.

Test Procedures

4.11	Sand and Dust Tests.
4.11.1	Can apply to unsheltered equipment intended for use in areas where sand and dust are a problem. For ground support equipment it would be more realistic to specify a test at 25°C (77°F) for 12 hours with operation of equipment optional, or the choice of a second procedure to test at 71°C (160°F) for 12 hours with operation optional.
4.11.2	Not significant in view of the above comments.

SECTION X

IMMERSION

Requirements

Requirements should be entered for check on leak proof design.

Test Procedures

4.12	Immersion Tests.
4.12.1	Can apply as a check on leak proof design.

SECTION XI

EXPLOSIVE ATMOSPHERE

Requirements

3.1.10	Can apply.

Test Procedures

4.13	Explosion-Proof Tests.
4.13.1.2	Not significant.
4.13.2	Not significant.

NOTE: Tests should be designed to determine that ground support equipment, both sheltered and unsheltered, intended for use in and about fueling and other danger areas, will neither create nor ignite air explosive gas mixture.

SECTION XII

TEMPERATURE-ALTITUDE

Requirements

Not significant.

Test Procedures

4.14	Temperature-Altitude Tests.
4.14.1	Not significant.

SECTION XIII

ACCELERATION AND SHOCK

Requirements

3.1.11	Can apply.

Test Procedures

4.15	Shock Tests.
4.15.1	Not significant.
4.15.2	Not significant.
4.15.2.1	Not significant.
4.15.2.2	Not significant.
4.15.3	Not significant.

NOTE: Tests should be designed to determine that the item or the packaged item will withstand handling and shipment by rail, motor van, air cargo and air drop where applicable. Items which are trailer or van mounted should withstand a road induced shock test which would depend upon the most rugged terrain likely to be encountered.

Tests should also be designed which would simulate shocks liable to occur during servicing and overhaul. A bench handling test similar to Method 5A, MIL-T-4807 (USAF) should be designed for items which are normally overhauled on work benches. Additional test procedures which would evaluate performance under rapidly applied loads at temperatures down to minus 65°F should be designed for unsheltered equipment intended for Arctic and Subarctic use.

4.16	Acceleration Tests.
4.16.1	Not significant.
4.16.2	Not significant.

SECTION XIV

BLOWING SNOW AND SNOW LOAD

Requirements

Requirements should be added for blowing snow and snow load.

Test Procedures

Blowing Snow Tests.

Tests should be designed to determine that unsheltered equipment, intended for Arctic and Subarctic use, will withstand blowing snow penetration, simulating conditions of MIL-STD-210, 1 June 1953.

Snow Load Test.

Tests should be designed to determine that unsheltered equipment, intended for Arctic and Subarctic use, will withstand snow load, simulating conditions of MIL-STD-210, 1 June 1953.

CONCLUSIONS

Specification MIL-E-5272 has little if any application in relation to sheltered ground support equipment because the test procedures are too elaborate and the extremes are too severe.

Specification MIL-E-5272 has limited application to unsheltered ground support equipment because the test procedures are primarily designed to evaluate airborne equipment.

Practically all of the tests which can apply to unsheltered equipment would require some modification.

Rather than applying a test procedure, to which exceptions and modifications must be made, it is more desirable to write a new specification which will evaluate sheltered and unsheltered ground support equipment.